



# Engineering Division

## Construction Document Review Checklist

### DEVELOPMENT SERVICES DEPARTMENT

4218 Waxhaw-Marvin Road  
PO Box 6  
Waxhaw, North Carolina 28173  
Phone: 704-843-2195

*This is a standardized document generated to facilitate consistent plan reviews. Additional requirements may be necessary based on site-specific conditions. Applicant should verify all items are provided in plans or calculations submitted to ensure a complete application prior to review.*

A. PROJECT INFORMATION			
Project Name:		Date Submitted	
Location:		Fee Submitted	\$
Design Contact:		Phone or Email	
FOR OFFICE USE ONLY			
Assigned Reviewer:		PRD Number:	
Application Complete	(Yes/No)	Comments Due:	

B. REVIEWS TO BE COMPLETED PRIOR TO CONSTRUCTION DOCUMENT REVIEW	YES	N/A
<b>1. CHECK THAT REVIEWS BELOW HAVE BEEN COMPLETED PRIOR TO SUBMITTAL</b>		
Rezoning (if site not properly zoned for proposed use)		
Conditional Rezoning		
Conditional Use Permit		
Subdivision Review (residential, multiple building sites and right-of-way dedication projects)		
Commercial Site Plan Review (non-residential projects)		
Traffic Impact Analysis (provided through Town process)		

Applicant to Complete the checklist below and include with submittal documents to the Town. Information missing from the submittal or not filled out below will be considered an incomplete submittal, and will be rejected by Town staff. Only complete submittals will be reviewed and provided comments. This checklist is a guidance document for the Town development requirements. For additional information regarding local site development reference the Town of Waxhaw [Land Development Code \(Town LDC\)](#), Town of Waxhaw Engineering Design and Construction Standards Procedures Manual, and Town of Waxhaw Stormwater Design Manual. The columns under the header "Town Staff Review" are to be completed by the Town of Waxhaw Engineering Division Reviewer.

C. TO BE COMPLETED BY APPLICANT	YES	N/A	Location Provided	TOWN STAFF REVIEW	
				SATISFIED	N/A
<b>1. GENERAL REQUIREMENTS</b>					
Cover Sheet with Project Name, Project Information and Designer and Owner Information					
Site Address and Vicinity Map					
Sheet List with Sheet Name and Number					
Original Submittal Date and Revision Dates Provided in Title Block					
Zoning labeled on plans, Conditional District Notes Included.					
North Arrow, Legible Scale					
Property(s) boundary (bearings and distances) and Deed Information					
Legend provide line-types symbols and hatching on all plan sheets					
U.S. Fish and Wildlife-Endangered Species Letter provided					



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Site Physical and Topographic Survey provided. To be signed and sealed by an NC registered surveyor and include: property boundary, existing paved areas, buildings and structures, utility locations, 1-foot contours, trees (12" DBH and larger), gravel areas, easements, and natural water bodies.					
Provide a letter from the utility owner granting permission, and/or an encroachment agreement from NCDOT.					
<b>Provide easement documentation for offsite grading.</b>					
FEMA floodplain and floodway boundaries identified with FIRM map and panel number provided					
North Carolina Department of Transportation Driveway Permit provided					
NCDEQ Construction General Stormwater Permit (NCG01/NCG25) obtained for sites over 1.0-acre					
NCDEQ State Post-Construction Stormwater Quality Permit obtained and provided					
Public water and sanitary sewer mains and connections submitted to Union County Public Works for review under separate submittal.					
Jurisdictional waters of the US (wetlands and streams) identified on the plans					
404/401 permit provided if impacting jurisdictional waters of the US.					
Obtain transportation mitigation agreement with Town					
In zoning data: Identify allowable impervious percentage and impervious provided					
<b>2. DEMOLITION PLAN</b>					
Existing Site Conditions shown based on Site Physical and Topographic Survey					
Denote existing structures, utilities, and paved areas to be removed					
<b>3. SITE PLAN</b>					
Existing and proposed property lines, easements (public and private), adjacent uses and zoning.					
Provide note identifying: Surveyor, Survey Date and Datum					
Existing and proposed driveways with widths shown, opposing driveway locations, sight distance (Town and NCDOT), right-of-way width and required future widths, street pavement width and material, street lane striping shown, curb, gutter and sidewalk.					
Existing and proposed building footprints, uses, square footages, and building distances from property line.					
Off-street parking layout and code required calculations. Location of any proposed on-street parking.					
Typical parking stalls dimensioned, parking aisles width dimensioned					
Radii of driveway and internal drive curb curvatures labeled.					
Cul de sac dimensions of 46' ROW and 36' pavement.					
Site circulation, striping, and signage denoted					
Travel path of delivery trucks and fire trucks shown with heavy duty pavement indicated along the proposed route. Provide truck routes on separate plan sheet.					
Location and size of external utility meters, HVAC systems, dumpster enclosures, transformers with detail of screening to be used.					
Light pole locations. Provide a Lighting Plan in compliance with Section 8.15 of the Town LDC. <b>Provide lights on landscaping plan.</b>					



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Plan note stating: Street Light Locations on this plan are approximate. Spacing requirements per Section 2 shall be met and the Town of Waxhaw reserves the right to deny street acceptance if lighting requirements are not met.					
Retaining walls indicated with necessary safety features in place. Provide retaining wall plans as outlined in Section C-4					
Provide retaining wall table including – Identification, Adjacent lot(s), length, and maximum height					
Accessible parking spaces with signs and painted symbols. Show dimensions					
Identify intersection Radii on site plan – See Engineering Design Criteria Section B.					
Sidewalk shown with ramps and curb ramps meeting accessibility requirements					
Pylon and monument sign locations indicated on the plan.					
Street trees shall be no less than 5 feet from a drainage inlet or junction box without approval from the Town Engineer.					
<b>4. GRADING AND DRAINAGE PLAN</b> <i>(Reference Town of Waxhaw Erosion Control Ordinance &amp; Standard Detail Section 300)</i>					
All design in accordance with the Town of Waxhaw - Provide details of all drainage structures of reference detail by number.					
Existing and proposed contours. Shown and labeled in intervals of two (2) feet of less. interval, existing dashed grey & proposed solid black. NAVD 88 datum.					
Critical spot elevations at all sidewalks & curb around building, accessible routes and parking, and concrete pads for dumpsters/trash compactors, door stoops, transformers, generator, etc.					
Drainage features shown including ditches, swales, channels, and watercourses; plans should include flow direction arrows and spot elevations.					
Building finished floor elevations indicated on all onsite structures existing and proposed.					
Accessible Routes shown with sidewalk grades have a 5% maximum longitudinal slope and 2% cross slope.					
Accessible parking, ramps and landing areas shown with spot elevations showing grades are 2% or less.					
Label all slopes 3:1 and steeper. Slopes steeper than 3:1 are supported by findings of a geotechnical report, and appropriately stabilized until vegetation is established. <b>No slopes greater than 3:1 are allowed in residential developments.</b>					
Specify slope matting and include specs for all permanent slopes					
All grading is shown within the property limits and/or public right-of-way. Indicate locations of grading easements offsite and provide documentation for approved easement.					
Sidewalk and cross-walk cross-slope at maximum 2%					
Guard rail placed near drive or parking stall parallel to and within 20' of slope steeper than 3:1 or elevation change greater than 8'					
Provide handrail adjacent to sidewalk within 3' of a slope of 3:1 or greater with an elevation change greater than 10'					
Earthwork requirements for compaction, foundation preparation, topsoil requirements, etc. noted in the plans.					
Location, size, invert and rim or grate elevations, and material for all existing and proposed storm sewer pipe, structures, and culverts on and immediately adjacent to the site.					
Storm sewer system designed to convey the 10-year 24-hour design storm intensity within the pipe.					



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Where roadway overtopping is anticipated, drainage that is picked up in a culvert (or other drainage structure) prior to crossing a road or driveway must be conveyed in a system designed for the 25-year 24-hour storm (50-year for thoroughfares). Flow calculations must be based on the appropriate design storm to the end of the system or to a relief point lower than the street elevation.													
Provide scaled profiles for all storm sewer systems and culverts showing and labeling the appropriate design hydraulic grade line (HGL). Indicate utility crossings and clearances.													
Post Development discharge leaves site in same direction and relative location as pre-developed condition. Identify offsite receiving conditions.													
Structures or flared end sections at all inlets and outlets of all pipe systems (no CMP or HDPE FES allowed)													
Non-standard drainage structures (CBs, HWs, FESs, bottomless culverts) will require sealed construction drawings.													
All building roof drain and scupper locations indicated on the plan.													
Minimum storm sewer pipe cover of two (2) feet.													
The minimum allowable slope is 0.5 percent, or the slope, which will produce a velocity of 2.5 fps <del>when the storm water in system is flowing full</del> , <b>for the 25-yr 24 hour storm event</b> , whichever is greater.													
Maximum velocity in pipes - 20 fps (10 fps for CMP)													
Maximum discharge velocity at pipe outlets is 10 fps except for pipes > 48" in diameter.													
Defined/stabilized pipe, flume and channel outlet locations. At a minimum, rip rap dissipator pads are provided at all outfall pipes.													
Riprap dissipators when provided at pipe outfalls at 0% slope, Min. L=10', Min. Depth=10".													
Properly sized and labeled Storm Drainage Easements (SDE) see widths below from: <table border="0" style="margin-left: 40px;"> <tr> <td>Pipe Diameter (inches)</td> <td>Pipe Easement Width (feet)</td> </tr> <tr> <td>15-36</td> <td>20</td> </tr> <tr> <td>42-48</td> <td>25</td> </tr> <tr> <td>54+</td> <td>30' min. (Varies)</td> </tr> </table>	Pipe Diameter (inches)	Pipe Easement Width (feet)	15-36	20	42-48	25	54+	30' min. (Varies)					
Pipe Diameter (inches)	Pipe Easement Width (feet)												
15-36	20												
42-48	25												
54+	30' min. (Varies)												
Stormwater maintenance and access easement provided from the public right-of-way to the BMP location and encompassing the BMP. Minimum 20' width. <b>Drainage Easements for rear and side yard swales – Minimum 20' width</b>													
Corrugated metal pipes must be aluminum or aluminized steel.													
Provide details of curb cuts and flumes													
Storm BMPs clearly labeled with Type, BMP number, surface elevations, minimum area and volumes, and reference applicable details. Designed to meet Town standards and calculations and drainage maps provided in Stormwater Calculation Report per <b>Section C-6</b> .													
BMP Primary Outlet Control Structure and Emergency Spillway clearly labeled. Emergency spillways placed in cut, if possible.													
Review potential impacts of storm outlet discharges downstream (i.e. property damage, erosion impacts, loss of life). Revise discharge location as needed.													
Emergency spillway is design to be non-erosive discharge for designed flow. Lining clearly labeled, as needed.													
Maintenance access provided to detention pond with gate, mountable curb, and gravel drive. Minimum top width of 10' for all BMP permanent earthen berms. 12' to 15' preferred for vehicular access. Minimum of 1' drop for cross-slope on berm.													



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Drainage at top and base of retaining walls considered. Ditches provided where necessary.					
For pipe systems not designed for Q100-YR that receives >50 cfs in Q100-YR, flood protection analysis is required. Refer to <b>Section D-4</b> for additional requirements.					
100-year floodplain and floodway boundaries, flood hazard soil boundaries, flood storage area easements, and regulatory flood protection elevations should be shown on plans. Indicate FEMA map and/or flood study numbers. If filling in floodplain, identify limits of filled area. Refer to <b>Section D-5</b> for additional floodplain development requirements.					
Proposed Right-of-Way or Roadway improvements must be shown on the plans. Plan and profile to be provided for Town maintained roadway construction meeting the requirements of the Town of Waxhaw Engineering Design and Construction Standards and Procedures Manual and indicating the proposed design speed.					
Maximum of one (1) acre runoff draining into the street at one point.					
No concentrated runoff flowing over Town sidewalks except at driveway entrances					
Roadside ditches sized to convey the 10-year design storm intensity (minimum 18-inches deep), and 25-year design storm intensity checked to prevent inundation of the pavement. Longitudinal slope minimum 1.0%, roadside side slope 3:1 maximum, and right-of-way side slope 3:1 maximum.					
Curb and gutter slopes not less than 0.5%; maximum spread of 6' on public streets based on rainfall intensity of 4"/hr.					
Intersections: Intersection with less than 2% cross slope may need additional CBs and spot elevations. Provide catch basin placement at intersections per Town Standard.					
Pipes in R/W 48" or less in diameter may be HDPE or RCP, >48" may be RCP, >60" may be aluminized steel; minimum 15"					
<b>Provide Note to Plan: Roadway Subgrade shall be proof rolled and inspected by representative of the Town prior to paving. Town must be notified a minimum of 24 hours prior to inspection.</b>					
<b>5. STORM BMP DETAILS</b>					
Plan View of BMP provided with detailed labels and grading shown.					
Scaled profile of BMP provided detailing locations and elevations of the primary and emergency spillways, permanent pool, treatment medias, underdrains, permanent and temporary pool, orifice control outlets, and designed water surface elevations.					
Custom details provided for primary spillway with sized and inverts of all orifices, spillways, grates, rims, pipes, emergency drains/valves, trash racks, anti-flotation device, and turn down devices.					
Emergency spillway detail provided indicating the design invert, width, length, and lining. Emergency spillways for ponds shall be designed to pass 50-year storm discharge. Place in cut, if possible, lining required in fill areas.					
BMP notes and specifications provided.					
Anti-seep method and locations indicated in plan and profile.					
Freeboard labeled. Minimum 6" freeboard above 50-year elevation on earthen basins (on basins less than 15' deep)					
Town standard detail; <b>identify sheet locations.</b>					
Summary table provided outlining the required and provided design volumes and permanent pool areas.					
Separate Plan View or plan sheet indicating proposed plantings and locations. If grass, then permanent seeding and stabilization methods specified.					
Liners noted and specified as needed.					



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<b>6. STORMWATER CALCULATION REPORT</b> <i>(Reference Town of Waxhaw Stormwater Design Manual)</i>					
All development submittals requiring calculations shall include a bound report sealed by an NC licensed engineer					
Table of contents <b>page numbers provided.</b>					
Narrative which gives background on the existing/proposed site, means by which hydraulics / hydrology were performed, and any other pertinent information needed to give a better understanding of methodology; including assumptions for design. Indicate how Town requirements were met and provide summary table of peak discharges from the site.					
USGS map, NRCS County Soils Map, FEMA FIRM provided with the site area indicated.					
Soils Hydraulic Soils Group (HSG) information provided for each soil type onsite.					
Pre-development and Post-development drainage area maps provided showing each point of analysis (POA) where discharge is leaving the site property boundary, all detained and undetained drainage, land coverage and associated CN values, soil types, time of concentration paths (label areas of sheet flow, shallow flow, and concentrated flow), impervious surfaces, and acreages.					
BMP drainage area map (Scale not to exceed 1" = 60') for detailed maps					
BMP sizing calculations showing NCDEQ methods and BMP volume calculations based on stage area.					
Stormwater structures in calculations and modeling must match labels on construction plans					
Anti-flotation calculations for primary risers					
Emergency spillway weir flow calculations and stabilization calculations.					
Pre- and post-construction peak discharge calculations for each outlet from the site (POA). Be sure to provide all supporting calculation routing data for the computation methods used (rainfall data for 2-, 10-, and 50-year storm events, time of concentration/storm duration, and runoff coefficients, detention volumes).					
Plan view of modeling schematic provided to supplement peak discharge calculations.					
Catchment Map for all storm sewer structures and culverts onsite indicating area in acreage, time of concentration and runoff coefficients for each structure.					
Storm sewer calculations table per Town requirements. For each pipe segment, the calculations should indicate at a minimum the catchment area, rainfall intensity, time of concentration, design discharge, design capacity/capacity full, rim elevation, pipe size, velocity, material, pipe invert upstream and downstream, and HGL upstream and downstream.					
Gutter flow and spread calculations. Curb and gutter slopes not less than 0.5 percent. Maximum 6 Feet spread <b>on public streets based on rainfall intensity of 4"/hr.</b>					
Discharge and velocity calculations for temporary and permanent open channel and ditch flows.					
Design calculations for cross sections and method of stabilization for existing and planned channels (include temporary linings). Include appropriate permissible velocity and/or shear stress data					
Design calculations and construction details for energy dissipaters below culvert and storm sewer outlets (include stone/material specs & apron dimensions).					
Design calculations and dimension of sediment basins and skimmers. A Rational C value of 0.6 and a Tc of 5 minutes should be used for cleared land.					



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<b>7. RETAINING WALL DETAILS</b>					
If more than one (1) retaining wall is proposed provide a retaining wall table which provides: Wall ID, approximate wall length, approximate wall height and sheet # where wall is located.					
Commercial retaining walls less than five feet tall are not required to have plan approval. However, retaining wall systems less than five feet in cumulative vertical relief and adjacent to a structure located closer than the vertical relief shall be designed under the responsible charge of a registered design professional and shall require a permit and inspection.					
Retaining walls designed in accordance with the North Carolina Building Code (NCBC). Provide note on plans.					
Retaining walls over five (5) feet in cumulative vertical relief shall be detailed in scaled cross-section and profile and signed and sealed by a NC licensed engineer. All notes and calculations shall be provided on the plans sheets.					
Wall shall be detailed showing product/wall type, material facing, structural supports, wall footings, wall tie-backs, geofabric and stone lifts, and wall drainage/weep holes.					
Retaining walls labeled with top of wall (TW) and bottom of wall (BW) spot elevations. Retaining walls over five (5) feet in height require details to be submitted per <b>Section C-7</b>					
If tree plantings, site lighting, guard rail, and/or safety rail are proposed within the structural footprint of the retaining wall, then provide details for proper installation.					
Detail all storm pipes planned to pass through or directly under the wall section.					
<b>Confirm 5-foot side and 20-foot rear setback from foundation of principal structure to retaining wall, including geogrid.</b>					
Add this note to the plan: "As-built details and Engineering letter certifying the retaining wall is built in accordance with NCBC and the approved plans will be required to be submitted to the Town prior to the final inspection approval and the issuance of the Certificate of Compliance."					
If the retaining wall is located adjacent to a walking or driving surface, safety guards and rails shall be installed in accordance with the provisions of 2012 NCBC Section 1013.					
NCBC Section 1807.2.1 require that retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the analysis.					
NCBC Section 1807.2.3 Safety Factor. Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combination of Section 1605 shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 1.0 times other nominal loads, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall. Exception: Where earthquake loads are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.					
<b>8. CHANNEL DESIGN</b>					
<i>(Reference Stormwater Ordinance Chapter 4)</i>					
<ol style="list-style-type: none"> <li>Channel cross-sections and calculations provided in plans or Storm Calculation Report.</li> <li>Maximum 3:1 side slopes.</li> <li>Sized to convey 10-year design storm intensity</li> </ol>					



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4. Minimum 6" freeboard 5. Final design of artificial open channels should be consistent with the velocity and shear strength limitations for the selected lining. 6. Liner specifications and design information from manufacturer. 7. Transition to channel sections with a minimum of 5:1 taper? 8. Channels with bottom widths > 10' must have a minimum bottom cross slope of 12:1. 9. Properly sized and labeled storm drainage easement (SDE) see widths below Area in Acreage              Channel Easement Width (feet) 1-45                              20 45-120                            30 120-500                          40 500+                              Per Town Engineer 10. Driveway pipes sized for Q10, check for roadway overtopping as required. 11. In case of 100+1 Overland Relief Channel. 12. Cross-sections at back of curb (beginning of channel), front of building pad(s), and back of building pad(s). Typical detail may be used beyond building pad(s). 13. 1' minimum freeboard at building pad(s).					
<b>9. 100+1 FLOOD ANALYSIS [Q<sub>100</sub>&gt;50 cfs]</b> <i>(Reference Stormwater Ordinance Chapter 4.3)</i>					
1. Overland Relief Point identified on plans. 2. Flood study calculations shall be sealed by PE. 3. Calculations for flow and time of concentration (T <sub>c</sub> ). 4. Runoff coefficients shall be based on assumption of full development of parcels per current zoning. 5. Include digital copy of channel analysis input file in submittal (e-mail or USB acceptable). 6. Proposed Stormwater Protection Elevations (SWPE) shall be labeled on site and grading plan for each lot (the SWPE should be based on Overland Relief Channel if applicable). 7. Show and label location of 100+1 Stormwater Elevation Line (SWEL) on site and grading plan. 8. Minimum 1,200 sf of buildable area per lot. 9. Show or describe on plan the location and elevation (ref. vertical datum, i.e. NAVD 88) of permanent benchmark used in channel survey. All topographic information shown on grading plan shall also be referenced to this benchmark. 10. Existing channel cross-section geometry used in analysis shall be based on a "Class A" field survey and shall be sealed by a RLS. <ul style="list-style-type: none"> <li>a. When fill is proposed within the 100+1 Stormwater Elevation Line, plotted channel cross-sections shall be included in the subdivision plan set and shall show both existing and proposed cross-section geometry. Sheets to be signed by a RLS for existing and PE for proposed conditions.</li> <li>b. When no grading is proposed within the 100+1 Stormwater Elevation Line, it is not necessary to include plotted cross-sections in the subdivision plan set. A note shall be added to the grading plan specifying that there shall be no grading within the limits of the 100+1 Stormwater Elevation Line.</li> <li>c. Cross sections taken perpendicular to the stream centerline, maximum 100' stations.</li> <li>d. Plot cross-sections showing the 100+1 elevation on site and grading plan.</li> <li>e. Cross-sections based on topographic map are subject to approval of the Town Engineer.</li> </ul> 11. In case of a bridge or culvert: <ul style="list-style-type: none"> <li>a. Cross-sections should be prepared at 25 feet from inlet and 5 to 20 feet from outlet.</li> <li>b. Road profile at culvert crossing to an elevation 2 feet above the low point of road.</li> <li>c. A physical description of the culvert (type, shape, invert, etc.).</li> <li>d. Upstream and downstream top of footer elevations for natural bottom culverts.</li> <li>e. Stormwater Protection Elevations for lots upstream of street crossings shall be based on the higher of the elevation determined by analysis or the low point of the road plus 1 foot.</li> </ul>					
<b>10. FLOODWAY [Drainage Area &gt; 640 Acres]</b> <i>(Reference Section 6.5 of the LDC Flood Damage Prevention Ordinance)</i>					
1. Creek name (label centerline). 2. Label the following lines clearly on grading and site plan:					



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<ul style="list-style-type: none"> <li>a. FEMA 1% Annual Chance Floodway Boundary Line.</li> <li>b. FEMA 1% Annual Chance Floodplain Boundary Line (often called "Flood Fringe").</li> <li>3. Floodway Cross-sections (Label, Stream Station, Location, Future Conditions Flood Elevation)</li> <li>4. Regulatory Flood Protection Elevation (RFPE): Base Flood Elevation(BFE) + 2' Freeboard for Residential Construction/ Base Flood Elevation(BFE) + 1' Freeboard for Commercial Construction)</li> <li>5. Contact Orion Holtey, at (704) 843-2195 concerning Floodplain Development Permit (any property crossed by a FEMA Floodline is subject to this permit. (Approval required prior to commencement of all construction activities.)</li> </ul>					